

CLAIMS

1. A thermo-electromechanical system comprising two mutually superimposed devices (A) in respective fireproof shells (A'), able to coil, on a relevant central chuck (6) by means of couples of input and output rolls (2), a pre-strip (a) with a thickness comprised between 30 and 8 mm from a roughing mill directly connected to a casting line for thin slabs, and subsequently to rotate on themselves and uncoil said pre-strip for allowing the inlet to the following descaler and finishing rolling mill, characterized in that
- 10 - said devices (A) have outer (4) and inner (7) burners of natural gas;
 - said inner burners (7) are able to optimise the temperature of the pre-strip (a) to be entered into the finishing roller mill, by means of a suitable control software also provided with an algorithm able to change the flow rate of burners to achieve automatically a steady temperature between the leading and trailing ends of the strip both when coiled and uncoiled or as a function of the kind of steel of pre-strip (a) and the properties to be obtained on the finished product;
 - 15 - said outer burners (4) are able to homogenize through a special control software the temperature of pre-strip (a) on the whole length thereof from the coiled core to a terminal tail portion (c), which remains outside, whereby the complete uniformity of the mechanical and geometric characteristics of the final product, responsive to temperature changes, is ensured;
 - 20 - actuating means are provided for the rotation of chucks (6) of upper and lower devices (A) both when coiled and uncoiled under control of special algorithms of the controlling software to speed up or slow down the coiling of pre-strip (a);
 - 25 - control means are provided for the speed of said pre-strip (a) both when being coiled and uncoiled, consisting of a special process software in order to avoid stretches or compressions of pre-strip, such as to jeopardize the geometric quality of the final product; and
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- means are provided for operating the stop of the chuck (6) by leaving said tail end (c) of pre-strip upon coiling at the outside of said devices (A) and said couples of rolls (2) for a length comprised between 0 and 800 mm, thus making easier, in the subsequent uncoiling, its entering to the following descaling and final rolling up to the finishing roll train.

2. A system according to claim 1, characterized in that, downstream of the in-line casting and hot rolling step, a shear cuts the pre-strip, and a first one of said controlling software algorithms of devices (A) speeds up the coiling thereof so as to create the required room to ensure the correct positioning of a helping device (1) to receive on the coiling device (A) the following strip.

3. A system according to claim 1, characterized by comprising a second algorithm of the control software suitable to allow the slowing down of the coiling step, immediately before its completion, when the distance from the following strip is sufficient to ensure its coiling, thus assisting the heating of the terminal portion (c) left outside the device (A) and rolls (2).

4. A system according to claim 1, characterized in that said chuck (6) on which the pre-strip (a) is wound comprises a drum formed of a central body (6.2) with central shaft (6.1) and side segments (6.3) held together by mutually fitted parts (6.6, 6.7, 6.6', 6.7') without the aid of bolts.

5. A system according to claim 4, characterized in that said chuck (6) is thermally insulated from the central shaft (6.1) on which it is mounted, the latter being hollow with an axial hole (6.4) for the cooling water, thus avoiding that the head and outgoing tail of the entering pre-strip (b) undergo such cooling as to jeopardize its capability to be rolled.

6. A process for the thermo-mechanical treatment of a pre-strip with a thickness comprised between 30 and 8 mm from a roughing mill directly connected to a casting line for thin slabs, comprising the coiling and subsequent uncoiling thereof to allow its forwarding to the finishing rolling, characterized by further comprising:

- the heating by burning natural gas, controlled by a special software of the pre-strip during the coiling and uncoiling steps, inside and outside the

coiling devices;

- the control, through special algorithms of the process software, of the coiling step for the relevant speeding up or slowing down;
 - the control, through a special process software, of the speed of pre-strip
- 5 during the coiling and uncoiling step.

7. A process according to claim 6, characterized in that the combustion for heating the pre-strip within the coiling device occurs with an excess of gas with respect to the stoichiometric ratio in order to assist in a reducing environment the formation of a surface oxide easily removable as a scale

10 in a subsequent descaling step.

AMENDED CLAIMS

[Received by the International Bureau on 10 December 2004 (10.12.04) ; original claims 1-6 and 7 amended ; remaining claims unchanged]

1. A thermo-electromechanical system comprising two mutually superimposed devices (A) in respective fireproof shells (A') with inner burners (7) of natural gas, able to coil, on a relevant central chuck (6) by means of couples of input and output rolls (2), a pre-strip (a) with a thickness comprised between 30 and 8 mm from a roughing mill directly connected to a casting line for thin slabs, and subsequently to rotate on themselves and uncoil said pre-strip for allowing the inlet to the following descaler and finishing rolling mill, characterized in that
- 10 - said devices (A) are also provided with outer (4) burners;
 - said inner burners (7) are able to optimise the temperature of the pre-strip (a) to be entered into the finishing roller mill, by means of a suitable control software also provided with an algorithm able to change the flow rate of burners to achieve automatically a steady temperature between the leading and trailing ends of the strip both when coiled and uncoiled or as a function of the kind of steel of pre-strip (a) and the properties to be obtained on the finished product;
 - 15 - said outer burners (4) are able to homogenize through a special control software the temperature of pre-strip (a) on the whole length thereof from the coiled core to a terminal tail portion (c), which remains outside, whereby the complete uniformity of the mechanical and geometric characteristics of the final product, responsive to temperature changes, is ensured;
 - 20 - actuating means are provided for the rotation of chucks (6) of upper and lower devices (A) both when coiled and uncoiled under control of special algorithms of the controlling software to speed up or slow down the coiling of pre-strip (a);
 - 25 - control means are provided for the speed of said pre-strip (a) both when being coiled and uncoiled, consisting of a special process software in order to avoid stretches or compressions of pre-strip, such as to jeopardize the geometric quality of the final product; and
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- means are provided for operating the stop of the chuck (6) by leaving said tail end (c) of pre-strip upon coiling at the outside of said devices (A) and said couples of rolls (2) for a length comprised between 0 and 800 mm, thus making easier, in the subsequent uncoiling, its entering to the following descaling and final rolling up to the finishing roll train.

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2. A system according to claim 1, characterized in that, downstream of the in-line casting and hot rolling step, a shear cuts the pre-strip, and a first one of said controlling software algorithms of devices (A) speeds up the coiling thereof so as to create the required room to ensure the correct positioning of a helping device (1) to receive on the coiling device (A) the following strip.

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3. A system according to claim 1, characterized by comprising a second algorithm of the control software suitable to allow the slowing down of the coiling step, immediately before its completion, when the distance from the following strip is sufficient to ensure its coiling, thus assisting the heating of the terminal portion (c) left outside the device (A) and rolls (2).

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4. A system according to claim 1, characterized in that said chuck (6) on which the pre-strip (a) is wound comprises a drum formed of a central body (6.2) with central shaft (6.1) and side segments (6.3) held together by mutually fitted parts (6.6, 6.7, 6.6', 6.7') without the aid of bolts.

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5. A system according to claim 4, characterized in that said chuck (6) is thermally insulated from the central shaft (6.1) on which it is mounted, the latter being hollow with an axial hole (6.4) for the cooling water, thus avoiding that the head and outgoing tail of the entering pre-strip (b) undergo such cooling as to jeopardize its capability to be rolled.

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6. A process for the thermo-mechanical treatment of a pre-strip (a) with a thickness comprised between 30 and 8 mm from a roughing mill directly connected to a casting line for thin slabs, comprising the coiling and subsequent uncoiling thereof to allow its forwarding to a finishing rolling step, providing for the heating (7) by burning natural gas during the coiling and uncoiling steps inside coiling devices (A), characterized by further comprising:

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- an additional heating (4) outside said coiling devices (A), with said inside

heating (7) being controlled by a special software of the pre-strip (a);

- the control, through special algorithms of the process software, of the coiling step for its respective speeding up or slowing down; and
- the control, through a special process software, of the speed of pre-strip (a) during the coiling and uncoiling steps.

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7. A process according to claim 6, characterized in that the combustion for heating the pre-strip within the coiling device occurs with an excess of gas with respect to the stoichiometric ratio in order to assist in a reducing environment the formation of a surface oxide easily removable as a scale

10 in a subsequent descaling step.